

1. An apparatus for chemical mechanical polishing of a wafer, comprising :
(a) a platen supporting a polishing surface;
(b) a chuck to hold the wafer against the polishing surface;
(c) a motor coupled to at least one of the polishing surface and the chuck to
5 generate relative motion therebetween; and
(c) an endpoint detector, comprising
(c1) a laser interferometer to generate a laser beam that is directed towards
the wafer and to detect light reflected from the wafer, and
(c2) a hole formed in the platen through which the laser beam passes to
10 reflect off a section of the wafer when the hole is positioned adjacent the section of the wafer.

2. The apparatus of claim 1, wherein the hole is filled with a portion of a fiber-
optic cable.

3. A chemical mechanical polisher, comprising:
a polishing surface that is movable relative to a substrate;
at least one light source to transmit light through the polishing surface to a film on the
substrate;
and at least one device that detects interferometric change in reflected light generated
20 when light is transmitted through the polishing surface to the film.

4. The chemical mechanical polisher of claim 3, wherein the at least one device
comprises a detector to detect said interferometric change and an analyzer for controlling the
chemical mechanical polisher in response to the detected interferometric change.

5. The chemical mechanical polisher of claim 4, wherein the analyzer analyzes
interferometric change in the reflected light to determine a change in dimension of the film.

6. The chemical mechanical polisher of claim 5, wherein the analyzer analyzes
30 interferometric change in the reflected light using interferometry at one wavelength.

7. The chemical mechanical polisher of claim 5, wherein the analyzer analyzes interferometric change in the reflected light using spectrophotometry over a continuous range of wavelengths.

5 8. The chemical mechanical polisher of claim 5, wherein the analyzer analyzes interferometric change in the reflected light to determine a change in thickness or planarity of the film.

10 9. The chemical mechanical polisher of claim 3, wherein incident and reflected light are transmitted through a rotating fiber optic cable embedded in a rotating platen below the polishing pad.

15 10. The chemical mechanical polisher of claim 3, wherein incident light is transmitted to a section of the film.

11. The chemical mechanical polisher of claim 3, wherein incident light is transmitted to more than one section of the film.

20 12. The chemical mechanical polisher of claim 3, wherein the light source produces a light of at least one wavelength between 200 and 11,000 nanometers.

13. The chemical mechanical polisher of claim 3, wherein the light source produces laser light.

25 14. A method of chemical mechanical polishing, comprising:
holding a substrate against a polishing surface;
moving the polishing surface relative to the substrate to polish a film on the substrate;
illuminating at least one section of the film with light transmitted through the moving
polishing surface during polishing of said at least one section; and
30 detecting interferometric change in light reflected from the at least one illuminated
section of the film that passes back through the polishing surface.

15. The method of claim 14, wherein the illuminating step includes generating a light beam from at least one light source that illuminates the at least one section of the film and the detecting step includes detecting a reflected portion of the light beam with at least one device that detects the interferometric change.

16. The method of claim 15, wherein said interferometric change is detected when said at least one section of the film passes over said at least one device.

17. The method of claim 15, wherein light from the light source that illuminates said at least one section and reflected light pass through a fiber optic cable embedded in the polishing surface.

18. The method of claim 18, further comprising controlling thickness change in the film in response to the detected interferometric change.

19. The method of claim 15, wherein the light directed through the polishing pad to the at least one section of the film comprises at least one wavelength between 200 and 11,000 nanometers, and the interferometric change in the reflected light is analyzed over one or more wavelengths.

20. The method of claim 14, wherein more than one section of the film is illuminated.

21. The method of claim 14, wherein polishing the film comprises reducing the thickness of the film or planarizing the film.

22. The method of claim 14, wherein a polishing endpoint is detected based on said interferometric change in the reflected light.

23. A method of claim 22, wherein the film is a metal film.

24. The method of claim 14, wherein the film is formed over a substrate.

25. The method of claim 24, wherein the substrate comprises at least one of an
5 insulating material, a conductive material, a semiconductive material, a silicon wafer, a
gallium arsenide wafer and a silicon on insulator.

26. The method of claim 24, wherein the substrate comprises a semiconductor
device over a silicon wafer.

27. The method of claim 14, wherein the film comprises at least one of an SiO₂
layer, a spin-on-glass layer, a tungsten layer, an aluminum layer, a silicon layer and a
photoresist layer.

28. The method of claim 14, wherein the film comprises a dielectric layer over a
semiconductor substrate.

29. The method of claim 14, wherein the film comprises at least one dielectric
layer over at least one metal layer.

30. The method of claim 14, wherein the film comprises a part of a semiconductor
device or an integrated circuit.

31. The method of claim 14, wherein said at least one section of the film is
25 illuminated with light including at least one wavelength between 200 and 11,000 nanometers.

32. A method of making a planarized substrate comprising
polishing a film on a substrate with a moving polishing pad;
illuminating at least one section of the film with light transmitted through the moving
30 polishing pad during polishing of said at least one section; and

detecting interferometric change in light reflected from the at least one illuminated section of the film.

33. A chemical mechanical polisher, comprising:
5 a polishing material having at least one optical access through which light can be transmitted to a portion of a film on a substrate;
a platen to support the polishing material; and
an interferometer to direct a light beam through the polishing material and detect
interferometric change in reflected light.

10 34. The chemical mechanical polisher of claim 33, wherein the at least one optical access in the polishing pad is transmissive to light comprising at least one wavelength between 200 and 11,000 nanometers.

15 35. The chemical mechanical polisher of claim 33, wherein the at least one optical access is a portion of a fiber optic cable.

20 36. The chemical mechanical polisher of claim 33, further comprising a focusing lens to enhance transmission of light passing between the polishing material and the film on the substrate.